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Title: Demo on Network-based QoE measurement for Video streaming services

1 Introduction:

Progressive download video services, such as YouTube, are responsible for a major part of the transmitted data volume in the Internet and it is expected, that they also will strongly affect mobile networks. Streaming video quality mainly depends on the sustainable throughput achieved during transmission. In order to achieve an acceptable video quality in mobile networks (with limited capacity resources), traffic engineering mechanisms have to be applied. For that, the streaming video quality needs to be measured and monitored permanently. Therefore, the video timestamps which are encoded within the payload of the TCP segments have to be extracted. For that it is necessary to decode the video within the transported payload. Algorithms for decoding Flash Video, MP4 and WebM Video have already been implemented as a demonstration implementation in support of the network based measurement contribution to SG12 by Chemnitz University for TCP encoded progressive download Internet services.

In the demonstration, the derived play out buffering from the monitored traffic is being output internally. A second application is then used to graphically display the estimation result.

The measurement and estimation is solely done within a measurement point of an operator network without access to the client's end device.

2 Demonstrator

To prove the functionality of video QoE estimation method a demonstrator was built up in different steps. The first version is only capable of processing offline PCAP traces of recorded traffic. The second version of the demonstrator is also capable of performing online measurements within the network. The setup of the YouTube demonstrator is shown in **Figure 1**. It consists of two computers. One of them provides the uplink to the Internet and also hosts the estimation tool. In order to detect valid video flows a simplified DPI function has been built in. The second computer has its Internet connection provided by the first one. The first can therefore observe the whole data traffic which is transferred to the second.

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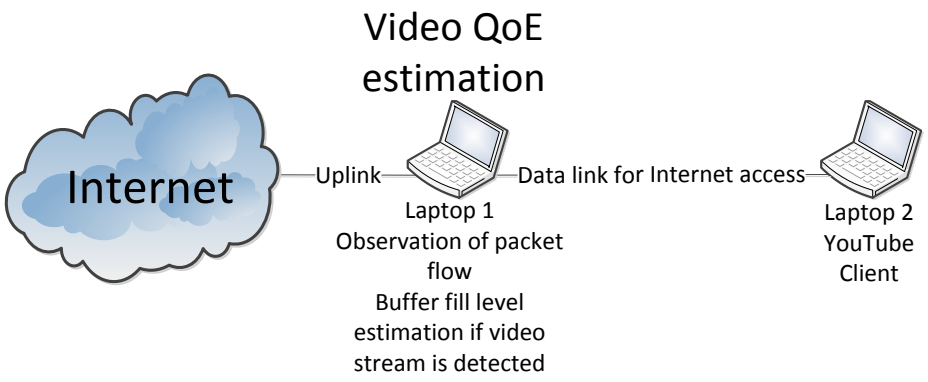

Figure 1: YouTube video QoE demonstrator setup

As soon as a video stream is detected by computer 1 the estimation algorithm saves the characteristics of the TCP session as 5-tuple. The 5-tuple consists of the protocol type, the source and destination IP addresses as well as the source and destination port. In a next step, each packed which fits to the 5-tuple is observed and the payload is decoded. As soon as a play out timestamp is extracted, the algorithm calculates the actual buffer fill level considering the occurrence and duration of stalling events. For the demonstration the estimated buffer fill level of computer 2 is displayed as a diagram on computer 1. The diagram is updated each second or whenever a TCP segment of the observed data flow is received.

3 Proposal

We suggest that such a simple demo setup should be provided for any QoE estimation procedures in order to prove their applicability and easy assessment of the client video experience as compared to the measurement result.

4 Acknowledgement

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